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by resonance. Thus far, however, I have failed to find more than a pipe sounding under slightly increased or slightly diminished pressure.

Again if the apparatus, figure 3, is made of insulating material (P , j removed) and is provided with a disc electrode parallel and coaxial with the surface M used as a counter-electrode, the combination becomes an absolute electrometer of considerable interest. All the usual experiments of the electroscope may be performed by means of it, with the potential readings immediately in absolute units.

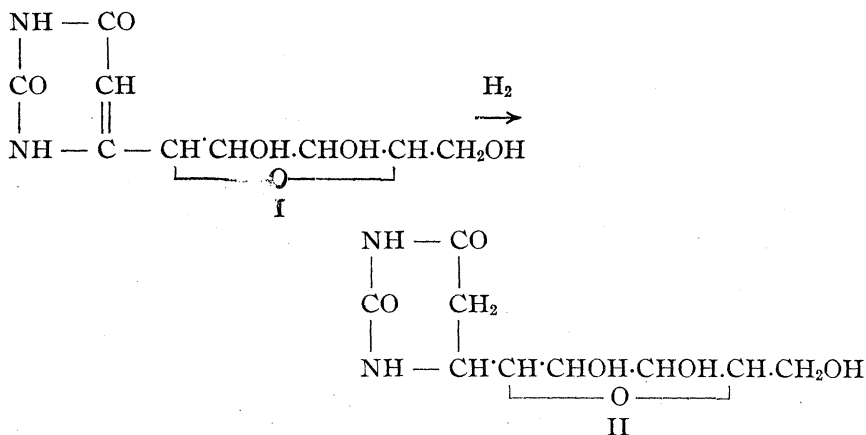
STUDIES ON CATALYSIS. I—THE REDUCTION OF URACIL TO HYDROURACIL

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Levene and LaForge,¹ in 1912, made the interesting observation that the nucleoside *uridine* I, which is obtained by hydrolysis of nucleic acid, is reduced practically quantitatively to dihydrouridine II by Paal's² method of catalytic reduction, namely, by means of colloidal palladium and hydrogen. This transformation involves an addition of hydrogen at the double bond joining positions 4 and 5 in the uracil nucleus and the change is represented as follows:



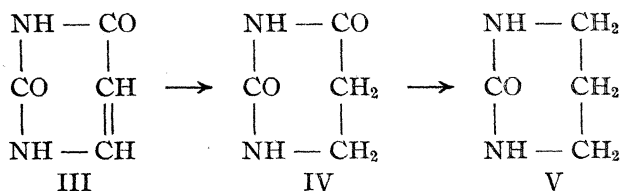
As far as the writers are aware, this is the first and only case described in the literature of the application of a catalytic process of reduction in the pyrimidine series. A striking fact revealed by the work of these investigators is the remarkable ease with which the sugar can be detached from this dihydrouridine molecule II by hydrolysis with acids. The corresponding uridine combination I is very stable and resistant to hydrolysis.

We have now inaugurated in the Sheffield Chemical Laboratory an extended research dealing with the application of catalytic methods of reduction and oxidation to pyrimidine, purine, hydantoin and glyoxaline compounds, and in this paper, the first of our series, we record the results obtained by direct reduction of the pyrimidine *uracil* with colloidal platinum.

The process which we have applied successfully for the reduction of uracil is based on the method of reduction developed by Skita.³ This investigator used both colloidal palladium and platinum in his work and utilized as a support for his colloidal metal gum arabic. He showed also that his colloidal metals were active in both acid and alkaline solutions.

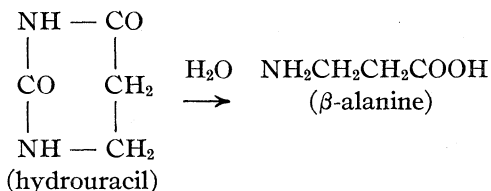
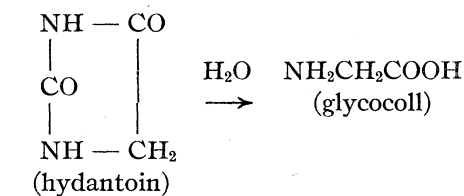
In our process we make use of a 10% solution of hydrochloroplatinic acid for preparation of our colloidal metal, and precipitate the activated metal in an aqueous solution of gum arabic by reduction with hydrogen gas without first introducing any colloidal metal to promote the reduction of the platinum chloride solution. Skita used in many cases a promoter to stimulate the formation of colloidal metal (Impfmethode). This was prepared by reducing platinum solution with formaldehyde in alkaline solution.

At a pressure of two atmospheres uracil III is reduced nearly quantitatively in aqueous solution to hydrouracil IV by action of hydrogen gas in presence of colloidal platinum. For example, when six grams of this pyrimidine were agitated in the reductor at a temperature of 75–85° C. and at a pressure of two atmospheres the reduction was complete at the end of seven hours, and almost a theoretical amount of hydrogen had added to the pyrimidine. The reduced pyrimidine melted at 272° C. and corresponded in all its chemical and physical properties with hydrouracil prepared by application of Hoffmann's reaction to succinimide.⁴ It did not respond to Wheeler and Johnson's test for uracil.⁵ We are now engaged in determining whether hydrouracil can be reduced still further by our catalytic method to the cyclic urea derivative of *syn*-trimethylenediamine V.



From both a biochemical and a synthetical point of view the synthesis of hydrogenated uracils by direct reduction of the pyrimidine ring is a reaction of considerable importance. These reduced uracils bear a similar relationship to β -aminoacids as the hydantoins do to α -aminoacids. A practical method of reducing uracil combinations, therefore, opens up a new method of synthesizing representatives of this important class of

aminoacids. The above relationships are expressed by the following equations:



Before undertaking our research on catalytic reductions we devised a practical machine whereby we might operate on a quantitative basis with large quantities of reagents. A description of this machine and a complete record of our preliminary work on uracil reduction will be published in a future number of the *Journal of the American Chemical Society*.

¹ *Ber.*, **45**, 1912 (619).

² *Ibid.*, **37**, 1904 (124); **38**, 1905 (1398, 1406).

³ *Ibid.*, **45**, 1912 (3579, 3595).

⁴ Lengfeld and Stieglitz, *Amer. Chem. J.*, **15**, 1893 (221).

⁵ *J. Biol. Chem.*, **3**, 1907 (183).

THE APPLICATION OF A DIFFERENTIAL THERMOMETER IN EBULLIOSCOPY

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For purposes of molecular weight determination of dissolved substances, the ebullioscopic procedure has certain advantages over the method of cryoscopy. Since, to use the latter, one must for convenience employ solvents whose freezing-points lie at easily accessible temperatures, it comes about that water, benzene and acetic acid have been commonly preferred. To obtain satisfactory values for the molecular weight of a solute, it is best to choose a solvent so alike to it chemically that compound formation between them shall be at a minimum. To be restricted in the choice of solvents is, therefore, a disadvantage. Boiling temperatures are preferable to freezing temperatures as disfavoring the formation of exothermic compounds. A majority of organic compounds boil nor-